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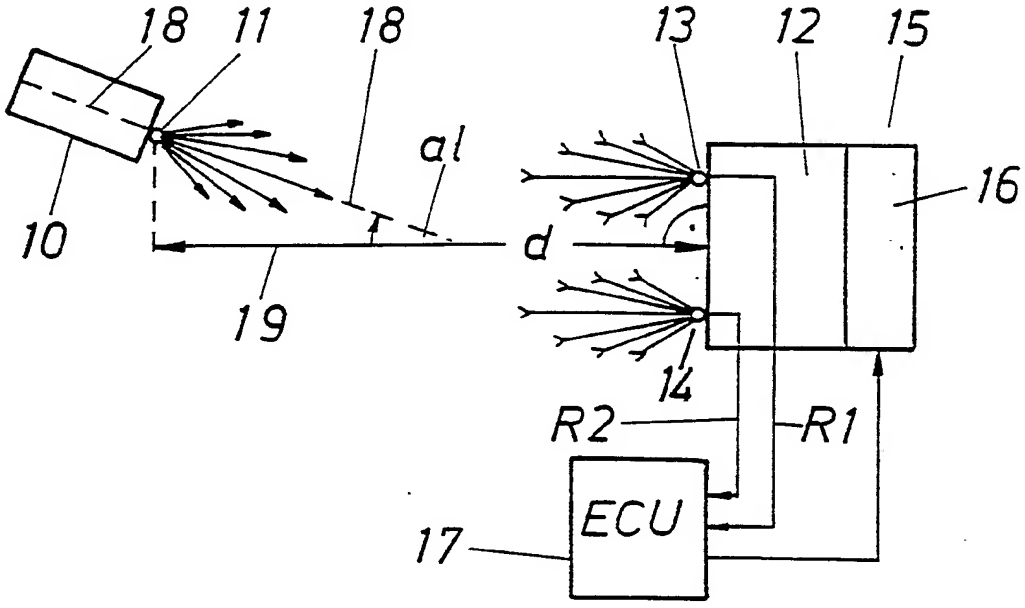
(54) Title: METHOD AND ARRANGEMENT FOR AN ANGLE-DEPENDED REMOTE CONTROL



(57) Abstract

A remote control transmitter (10) transmits a beam with a known radiation diagram. A remote control receiver (12) having sensors (13, 14) with known pick up patterns calculates the distance between the transmitter and the receiver with the aid of a sum signal of the sensors. With the aid of sensor-difference signals and the distance an angle between the transmitter and the receiver can be determined. The present invention can be used for controlling a TV-set.

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Method and Arrangement for an angle-depended remote control

The present invention relates to a method for an angle-dependend control according to the generic part of claim 1, to an arrangement able to execute the said method according to the generic part of the first device claim, and to an appropriate use according to the generic part of the first use claim.

Remote control arrangements, including a transmitter and a receiver, are well known for controlling consumer electronic devices, such as television sets, tuners, compact disc players, etc. The remote control transmitter includes a transmitting element, which may be designed as light emitting element, e.g. LED, sound emitting element or thelike. The remote control receiver is equipped with according receiving elements, like light sensors, microphones, etc.

The European patentapplication EP 377 055 A1 presents an electrooptical arrangement for the remote control of electronical devices. This arrangement includes a remote control transmitter having three light sources with radiation diagrams different to eachother and in relation to the three space axes.

In dependence on the angle between the transmitter and the receiver, the receiving element receives different radiation intensity, their relations to eachother are analyzed for the determination of the said angle.

As the arrangement of EP 377 055 A1 needs three transmitting elements with different radiation diagrams, it is quite expensive to realize and the transmitter, which is normally supplied by a battery has a high energy consumption.

It is an object of the present invention to present a method and an according arrangement for an angle-dependend remote control, which may be realized with reduced costs compared to known systems.

It is another object of the invention to reduce the power requirement of a transmitter, which is part of an angle-dependend remote control arrangement.

This is realized by a method according to claim 1 and by an arrangement according to the first device claim.

According to the invention, a remote control transmitter having a transmitting element, transmits a beam with a known radiation diagram.

A remote control receiver is provided with a first and a second sensor (receiving element). Each of these sensors has a known pick up pattern (directional diagram for reception) in that plane, in which an angle is to be determined. When a beam is transmitted by the transmitter, and the transmitter is moved, the signalstrength of signals received by the first sensor and the second sensor changes.

In a wide range of angles the sum of the signalstrength of the said signals is a value for the distance between the receiver and the transmitter. This sum value and the difference value of signalstrength between both sensors is taken into account for the calculation of the angle value.

If more than one angle in different planes is to be determined, the receiver is provided with a pair of sensors with pick up patterns in each plane. Each of these angles can be determined in a way like it has already been described.

For the realization of a remote control arrangement according to the invention, it is just necessary to redesign the receiv-

ing part. That means, transmitters, which have already been produced, can be taken.

It is preferred to use the present invention for the selection of one or more fields, which are linked to the said receiver. The selection of this field can be achieved with the aid of the values of a detected angle and a detected distance between the transmitter and the said field.

If the said field is a screen of a television set or a part of this screen, the said television set can be remote-controlled in a convenient way.

Further characteristics, advantages and details of the invention will be explained with the aid of the following embodiments and accompanying drawings, where

Fig. 1 shows a remote control arrangement including a transmitter and a receiver;
Fig. 2 shows the directional diagrams for transmitting and reception;
Fig. 3a, b shows sum diagrams of signalstrengths as function of angle Al and distance d;
Fig. 4 shows a diagram of sum values of signalstrength as function of distance d;
Fig. 5 shows a diagram of difference values of signalstrength as function of angle Al and distance d;
Fig. 6 shows a menue-control arrangement.

Figure 1 shows a remote control arrangement including a remote control transmitter 10 having a transmitting element 11 and a remote control receiver 12 having a first sensor (receiving element) 13 and a second sensor (receiving element) 14.

The transmitting element 11 has a directional diagram as indicated by the outgoing arrows and the receiving elements 13, 14 have pick up patterns as indicated by the incoming arrows.

In this embodiment the receiver 12 is part of an electronic device 15, e.g. of a TV set, and the block 16 indicates known means of this device 15, which may be for a TV set e. g. a tuner, video processing means, deflection means, etc.

The sensors 13, 14 convert the received signals according to their signalstrengths to electrical signals R1, R2 with different values r1, r2 respectively. The signals R1, R2 are led to inputs of an electronic control unit (ECU) 17, output signals of which are led to the block 16.

The position of the transmitter 10 in relation to the receiver 12 in a given plane is defined by a distance d in the said plane and an angle Al, e.g. given by the angle between a center line 18 of the transmitter 10 and a line 19 perpendicular to a connection line of the sensors 13, 14.

Possible forms of the directional diagrams of the transmitting element 11 and of non-osculating pick up patterns of the sensors 13, 14 are, in principle, shown in figure 2.

For non-osculating pick up patterns the sum of singalstrength for of the received signals result in sum values S1 = r1 + r2. The relations between S1 and the angle values al can be seen in figure 3a.

The upper curve indicates the sum values for a distance d = d1 and the lower curve indicates the sum values for a distance d = d2, where d1 is smaller than d2.

Figure 3b shows sum-values S2 = r1 + r2 derived from the singalstrength for the received signals using sensors 13, 14

with osculating pick-up patterns as function of the angle values al. The upper curve indicates sum-values for the distance d = d1 and the lower curve for the distance d = d2.

For a special kind of the transmitting element 11 and sensors 13, 14 used in this embodiment, the correlation between the sum-values S and the distance d is indicated in figure 4.

In the realized embodiment the remote control transmitter "THOMSON RCT 5000" and the remote control receiver used in TV chassis "THOMSON ICC5-IMC" were taken. The following relations were determined for the said remote control system.

With the aid of known correlation methods it can be determined that

$$S = 166 / (d^2) \quad \text{or} \qquad (1)$$

$$d = (166/S)^{1/2} \qquad (2)$$

The correlation between difference values D of the signal-strengths of sensor 13 and sensor 14 and values al of the angle Al and the distance d is shown in figure 5, where d1 is smaller than d2 and d2 is smaller than d3.

Inside a certain range, indicated by dotted lines, the difference values D are nearly a linear function of the angle values al. In dependence on the distance d the inclination m of the curves for d1, d2, d3 increases inside the linear range with decreasing distance. Mathematically the dependence between the difference values D, the values al and the inclination m can be expressed by

$$D = -m*al \qquad (3)$$

It can be found that for the transmitting element 11 and sensors 13, 14 used

$$m = 5{,}5/(d)^2 \qquad (4)$$

Equations (2), (3) and (4) result in

$$D = - \frac{5{,}5}{d^2} * al = - \frac{5{,}5 * S}{166} * al \qquad (5)$$

or

$$al = - \frac{D * 166}{S * 5{,}5} \qquad (6)$$

The calculation according to relation (6) is performed by means included in the elctronical control unit 17.

If a further angle Be in a second plane is to be determined, a second pair of sensors with directional characteristics in the said second plane must be provided and the sum and difference values of according signalstrength can be taken for the calculation of values be of the second angle Be as mentioned in equation (6).

The calculated values al, be can be taken for the control of a menue shown by the screen of a monitor, a TV set or the like.

For such an application the electronical control unit 17 is able to send according control signals to the block 16.

A control menue arrangement is in principle shown in fig. 6. The TV set 15 including the block 16 shows on his screen 20 a

menue with a bottom field 21 and a main field 22 for controlling several functions.

In this example the main field 22 comprises figures, which indicate slide resistances for controlling a stereo balance (B), a sound characteristic (S) and the volume (V).

The first pair of sensors 13, 14 and a second pair of sensors 23, 24 are provided for the detecting of signalstrengths in the horizontal plane and the vertical plane respectively.

With the determined values al, be and the difference-value d the menue-position x1, y1 the transmitter is directed to can be calculated:

$$x1 = d * \tan al$$
$$y1 = d * \tan be.$$

and a cursor can be generated by the means of block 16.

Thereby a userfriendly remote control can be realized.

Additionally it may be mentioned that a movement in a direction perpendicular to one of the planes is also indicated by the according pair of sensors and the said cursor can be moved.

Versions of the said embodiments may include at least one of the following variations:

- instead of a consumer electronic device any other device can be controlled, which is connected with the remote control arrangement;
- one of the receiving elements may be taken for a remote control in more than one plane;
- if one of the receiving elements is taken for a control in more than one plane according modulation methods, like time multiplex, may be used;

- the distance d between the transmitter and the receiver can be determined by other known methods. Values of said distance can be used for a calculation according to relation (5);
- the calculated distance d may be used for an according display for a viewer. This can be realised e.g. by displaying numbers, showing according graphics or thelike. It is even possible to generate sound signals, e.g. when the distance between the viewer and the TV set is belower a recommended minimum distance;
- the calculated distance d may be used for controlling the size of symbols to be displayed, which means the size of graphics, e.g. like the figures for controlling system values (stereo balance B, sound characteristic S, volume V,...), the size of alphanumerical symbols or thelike. Thereby a viewer can see according displays either larger (d is large) or he has a better overview with smaller symbols (d is small).

By this invention a system, including a method and an according arrangement, for an angle-dependend remote control in at least one plane is presented.

The remote control arrangement comprises

- a transmitter having one or more transmitting elements with a known radiation diagram in the said plane, and
- a receiver having sensors (receiving elements) with known pick up patterns in the said plane.

In dependence on the radiation diagram and the pick up patterns two relations can be determined. A first relation is given between the sum values of signalstrengths of the received signals and the distance d between the transmitter and the receiver. A second relation is given between the difference values D of signalstrengths of the received signals and

the angle value al to be determined, with the distance d, or values desived from the sum values, as parameter.

With the aid of the said two equations an angle between the transmitter and the receiver can be determined.

This can be applied e.g. for the control of a menue indicated on the screen of a television set.

The calculated value d for the distance between the remote control transmitter 10 and the receiver 12 is nearly the same as the distance between a user and the device 15. That is why the value d can be used for indicating the according distance. This can be displayed, e.g. with the aid of graphics, alphanumerical symbols, sound signals or thelike. Thereby the user can be informed for example if he is inside a recommended distance range to the device 15. This application of the calculated value d can be used independend on an angle-dependend remote control.

The calculated value d can also be used for controlling the size of diagrams, alphanumerical symbols or thelike. This application of the calculated value d can also be used independend on an angle-dependend remote control.

Claims

1. Method for an angle dependend remote control, a first angle in at least one plane between a transmitter having transmitting elements and a receiver having receiving elements is to be determined, characterized in that the angle to be determined is calculated by the difference of signalstrengths of signals received by said receiving elements and the distance between said transmitter and said receiver.

2. Method according to claim 1, characterized in that in dependence on the radiation diagrams of the transmitting elements and of the receiving elements a first relation between sum values of the signalstrengths of signals received and the distance between said transmitter and said receiver and a second relation between difference values of the signalstrengths of signals received and said angle with the distance values as parameter are determined and with the aid of said given relations said angle is calculated.

3. Method according to claim 1 or 2, characterized in that said first angle is to be determined in said first plane and a second angle is to detected in a second plane, said receiver contains two receiving elements with directional characteristics in each of said planes.

4. Method according to one of the claims 1 to 3, characterized in that the value (d) of the distance between said transmitter and said receiver is used for controlling the size of symbols to be displayed and/or for displaying, e.g. acoustically, optically, or thelike, the value d for a user.

5. Remote control arrangement including a transmitter (10) and a receiver (12), for an angle-dependend control in at least one plane, first angle (Al) in a first plane between said receiver (12) and said transmitter (10) having a transmitting element (11) is to be determined, characterized in that said receiver (12) includes two receiving elements (13, 14) with directional characteristics in said first plane, calculation means (17) are provided, which calculate said first angle (Al) to be determined by the difference of signalstrengths of signals received by said receiving elements (13, 14) and the distance between said transmitter (10) and said receiver (12).

6. Arrangement according to claim 5, characterized in that in dependence on the radiation diagrams of the transmitting elements (11) and the receiving elements (13, 14) a first relation between sum values of the signalstrengths of signals received and the distance between said transmitter (10) and said receiver (12) and a second relation between difference values of the signalstrengths of signals received and said angle (Al) with the distance values as parameter are determined and calculation means (17) connected to said receiving elements (13, 14) calculate said angle (Al) with the aid of said relations and values of signalstrengths.

7. Arrangement according to claim 5 or 6, characterized in that said transmitting element (11) emits a light beam and the receiving elements (13, 14) are designed as light sensors.

8. Arrangement according to one of claims 5 to 7, characterized in that said first angle (Al) is to be determined in said first plane and a second angle (Be) is to determined in a second plane, said receiver (12)

includes two receiving elements (13, 14; 23, 24) with directional characteristics in each of said planes.

9. Arrangement according to one of the claims 5 to 8, characterized in that means are provided which use the value (d) of the distance between said transmitter (10) and said receiver (12) for controlling the size of symbols to be displayed and/or for displaying, e.g. acoustically, optically, or thelike, the value d for a user.

10. Use of the method according to one of the claims 1 to 4 or of the arrangement according to one of claims 5 to 9, characterized in that a position on a field (20) linked to said receiver (12) where the transmitter (10) is pointed to is determined with the aid of said angle (Al) and the distance between said field and said transmitter (10).

11. Use according to claim 10, characterized in that said field is at least a part of a screen (20) of a television set (15) and functions of said television set can be angle-dependend controlled.

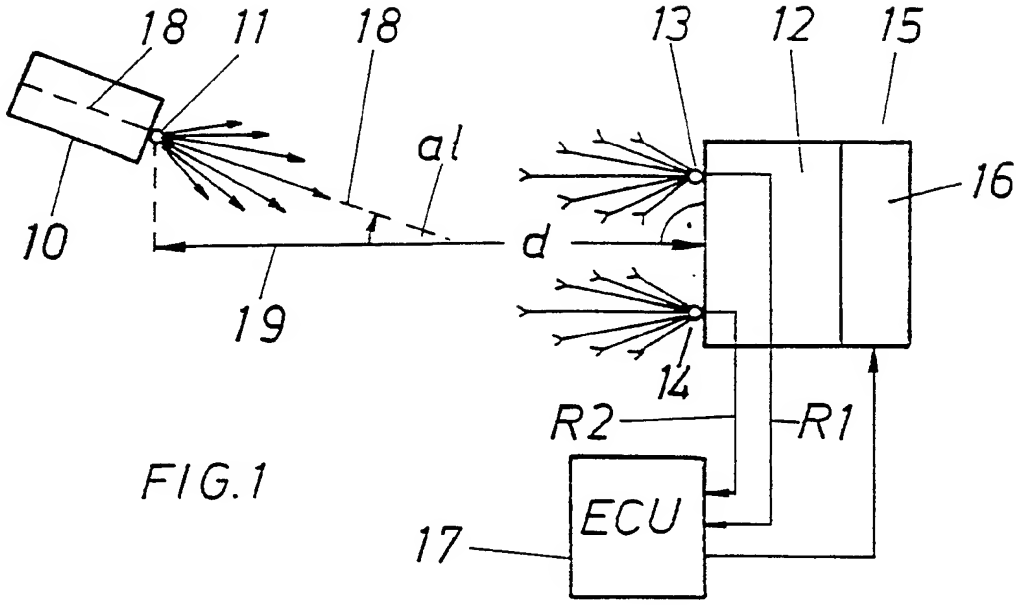

FIG.1

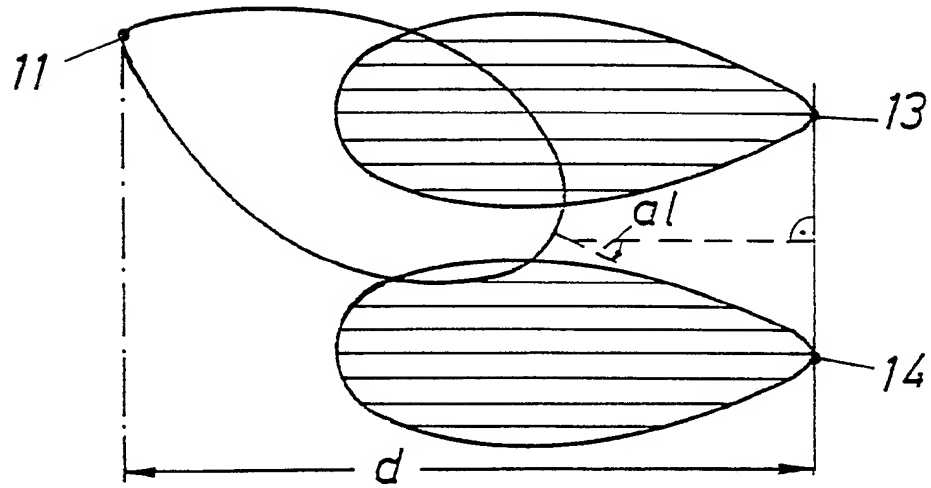

FIG. 2

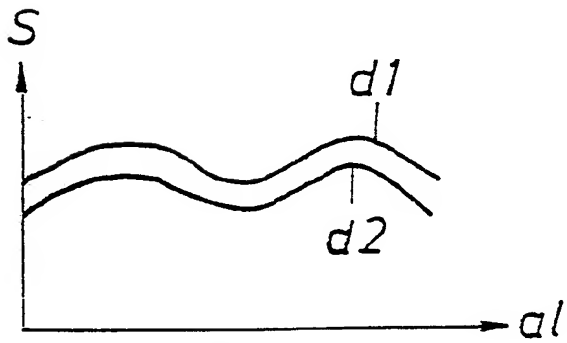

FIG.3a

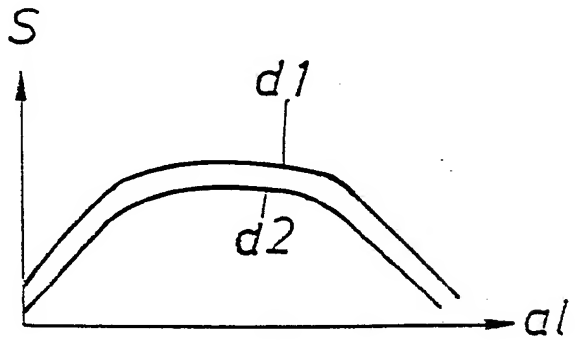

FIG.3b

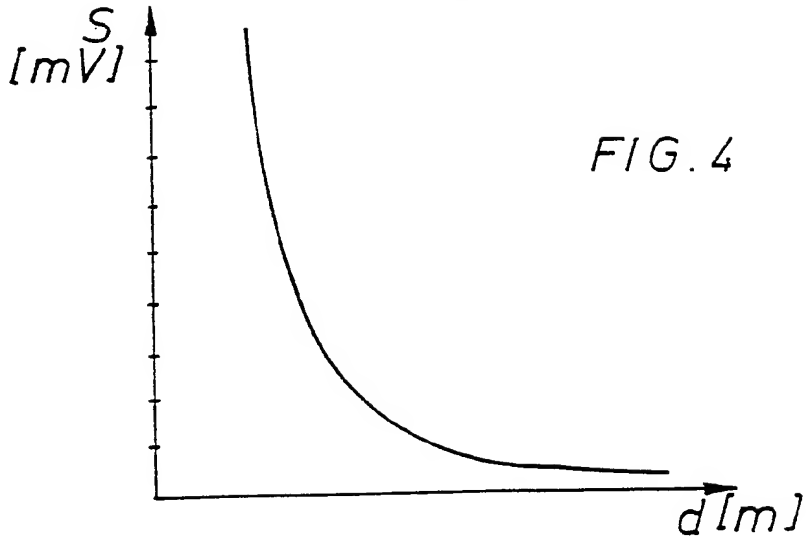

FIG. 4

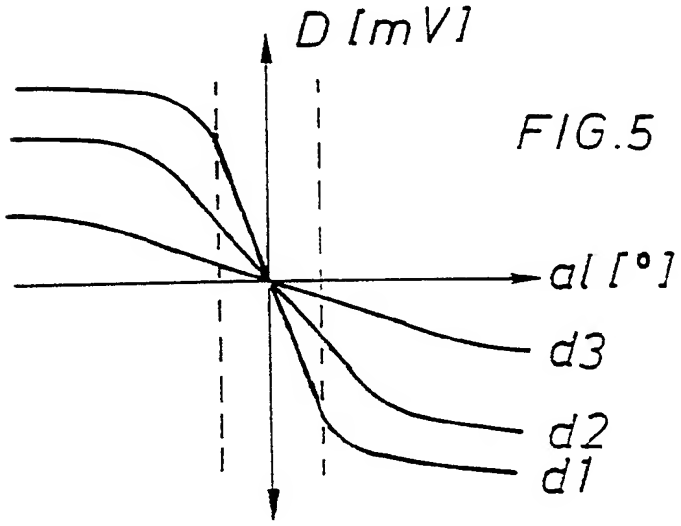

FIG. 5

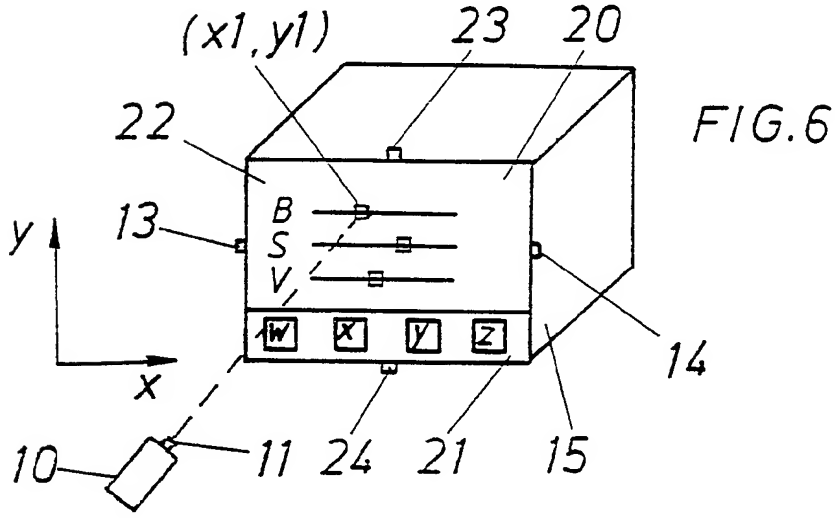

FIG. 6

INTERNATIONAL SEARCH REPORT

International Application No PCT/EP 92/02197

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 G08C23/00; G06K11/08

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl. 5	G08C ; G06K ; H03J

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
X	WO,A,8 804 060 (STARPEAK COMPUTERS LIMITED) 2 June 1988 see page 11, line 9 - page 12, line 30 see page 20, line 19 - page 21, line 10 see figures 7-9	1-3,5-8, 10,11
A	EP,A,0 357 909 (NOKIA UNTERHALTUNGSELEKTRONIK (DEUTSCHLAND) GMBH) 14 March 1990 see column 5, line 10 - line 55; figure 3	1,5,7, 10,11
A	PATENT ABSTRACTS OF JAPAN vol. 13, no. 350 (E-800)7 August 1989 & JP,A,11 09 899 (MATSUSHITA ELECTRIC IND CO LTD) 26 April 1989 see abstract	1,2,5-7, 10

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
03 NOVEMBER 1992	13. 11. 92
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	WANZEELE R.J.

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 15, no. 287 (P-1229)22 July 1991 & JP,A,30 98 032 (OLYMPUS OPTICAL CO LTD) 23 April 1991 see abstract -----	1,2,5-7, 10

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. EP 9202197 SA 64699

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 03/11/92
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A-8804060	02-06-88	AU-A- 8237987	16-06-88
		EP-A- 0344153	06-12-89
		US-A- 5009501	23-04-91
EP-A-0357909	14-03-90	DE-A- 3828334	22-02-90
		JP-A- 2186799	23-07-90